PROBLEMS FOR SOLUTION.

ARITHMETIC.

71. **Proposed by J. C. CALDERHEAD, M. Sc., Professor of Mathematics in Curry University, Pittsburg, Pennsylvania.**

A man owes me \$200 due in 2 years, and I owe him \$100 due in 4 years; when can he pay me \$100 to settle the account equitably, money being worth 6% ?

72. **Proposed by W. H. CARTER, Professor of Mathematics, Centenary College of Louisiana, Jackson, Louisiana.**

Though the length of my field is 1-7 longer than my neighbor's, and its quality is 1-9 better, yet as its breadth is 1-4 less, his is worth \$500 more than mine. What is mine worth? *Encyclopedia Brittanica.*

73. **Proposed by NELSON S. RORAY, South Jersey Institute, Bridgeton, New Jersey.**

I would like to change problem 70, Arithmetic, to read as follows and have it proposed for solution:

A owes me \$100 due in 2 years, and I owe him \$200 due in 4 years. When can I pay him \$100 to settle the account equitably, money being worth 6%, and *the interest to draw interest until the time of settlement?*

Solve by simple arithmetic without the aid of algebraic symbols.

74. **Proposed by JOHN T. FAIRCHILD, Principal of Crawfis College, Crawfis College, Ohio.**

When U. S. bonds are quoted in London at $108\frac{3}{4}$ and in Philadelphia at $112\frac{1}{4}$, exchange \$$4.89\frac{1}{2}$, gold quoted at 107, how much more was a \$1000 U. S. bond worth in London than in Philadelphia?

ALGEBRA.

74. **Proposed by NELSON S. RORAY, South Jersey Institute, Bridgeton, New Jersey.**

Solve according to the conditions given:

$$\sqrt{x+1}+\sqrt{x}=\frac{3}{\sqrt{1+x}}.$$

First, square without transposing and then solve; second, transpose $\sqrt{x+1}$ and then solve. Obtain the same roots as in the first way of solving.

75. **Proposed by B. F. BURLESON, Oneida Castle, New York.**

Mr. B's farm is in shape a quadrilateral, both inscriptible and circumscriptible, and contains an area of $k=10752$ square rods. The square described on the radius of its inscribed circle contains $r^2=2304$ square rods; while the square described on the radius of its circumscribed circle contains an area of $R^2=7345$ square rods. Required the lengths of the sides of his farm.

76. **Proposed by E. B. ESCOTT, Fellow in Mathematics, University of Chicago, Chicago, Illinois.**

Prove the identities

$$2-\sqrt{2}=\tfrac{1}{2}+\frac{1}{2^2.3}+\frac{1}{2^3.3.17}+\frac{1}{2^4.3.17.577}\cdots\cdots$$

$$\frac{5-\sqrt{5}}{2}=\tfrac{1}{1}+\tfrac{1}{3}+\frac{1}{3.7}+\frac{1}{3.7.47}+\frac{1}{3.7.47.2207}\cdots\cdots$$

77. **Proposed by G. I. HOPKINS, Instructor in Mathematics and Physics in High School, Manchester, New Hampshire.**

Solve the equation, $(6x^2+x-3)^2-48^2=(x+15)^2$.

GEOMETRY.

69. **Proposed by WILLIAM SYMMONDS, M. A., Professor of Mathematics and Astronomy in Pacific College, Santa Rosa, California; P. O., Sebastopol, California.**

To divide a square card into right-lined sections in a manner, that a rectangle of a given breadth can be formed from the sections; likewise, form a square from a rectangular card.

70. **Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy in Ohio University, Athens, Ohio.**

Prove that the locus of the center of the circle which passes through the vertex of a parabola and through its intersections with a normal chord is the parabola $2y^2=ax-a^2$, the equation to the given parabola being $y^2=4ax$.

71. Prove by pure geometry: A perpendicular at the middle point, M_a, of the side BC of the triangle ABC meets the circumcircle in A'. On this perpendicular A'' and A''' are taken so that $M_aA''=M_aA'$ and $A''A'''=AH$. (H is the orthocenter of triangle ABC). Prove that A''' is on the circumcircle. *Anon.*

72. **Proposed by O. W. ANTHONY, M. Sc., Professor of Mathematics, Columbian University, Washington, D. C.**

If a line with its extremities upon two curves move in any manner whatever, (the line may vary in length), and P a point upon the line which divides it in the ratio $m:n$ describe a curve, the area of this curve will be given by the formula—

$$A=\frac{(m^2+nm)A_1+(n^2+mn)A_2-mnA_3}{(m+n)^2}.$$

73. Prove by pure geometry: (1) A', B', and C' are the middle points of the arcs BC, CA, and AB respectively. With these points as centers, circles are described passing through B and C, C and A, and A and B respectively. Prove that these circles intersect in O, the center of the incircle of the triangle ABC; (2), that O, the center of the incircle, is Nagel's point of the triangle formed by joining the middle points of the sides. *Anonymous.*

CALCULUS.

61. **Proposed by W. H. CARTER, Professor of Mathematics, Centenary College of Louisiana, Jackson, Louisiana.**

If $r=a\sin n\theta$ is the polar equation of a curve, show (1) that the curve consists of n or $2n$ loops according as n is an odd or an even integer; (2) that its area is $\frac{1}{4}$ or $\frac{1}{2}$ of the circumscribing circle according as n is an add or an even integer.

62. **Proposed by A. H. HOLMES, Brunswick, Maine.**

A bucket is in the form of a frustum of a cone having its smaller end as a base. It is a inches in diameter at base and b inches in diameter at top, and its perpendicular